



Type Approval Certificate

[Ballast Water Management System]

Initial Approval 19th August, 2021
Manufacturer DESMI Ocean Guard A/S
 Tagholm 1, 9400, Norresundby, Denmark

Product Description Ballast Water Management System
 - Model : CompactClean BWMS (Ex)

Treatment Sequence:

- Ballast Water Uptake : Filtration and UV Disinfection
- Ballast Water Discharge: UV Disinfection

Place of production:

- 1) DESMI Ocean Guard A/S : Tagholm 1, 9400 Norresundby, Denmark
- 2) DESMI Pumping Technology (suzhou) Co., Ltd.
 : 1st to 3rd Floor of No.4 Office, Building and No.5 Building,
 No.108 Houdai Street, SIP, Suzhou City, Jiangsu Province, P. R. China

Approval Condition " See Appendix 1 "

THIS IS TO CERTIFY that the above-mentioned product has been approved in accordance with the relevant requirement of this Society's Rules and / or of the recognized standards as follows.

Resolution MEPC.300(72) - Code for Approval of Ballast Water Management Systems, Part 9 Rules for the Classification of Steel Ships and Guidance of Approval of Manufacturing process and Type Approval, Etc.

This Certificate is valid until 18th August, 2026

Reissued at Busan, Korea on 8th November, 2021



This certificate is signed electronically in accordance with IMO FAL.5/Circ.39/Rev.2. Validation and authentication of the certificate can be confirmed from "<http://e-cert.krs.co.kr>" by using the tracking No(ME21027350999) and certificate No.(CPH44704-BT001).



KOREAN REGISTER

*General Manager of
Marine & Ocean Equipment Team*

- Note :**
1. This certificate will be valid subject to complying with the approval conditions described on the certificate and/or on the Rules of this Society.
 2. This certificate will be invalid from the expiry date aforementioned unless the extension or renewal has been granted to the applicant or the manufacturer.
 3. Any significant modifications or changes in design or construction to the above product without approval from this Society will render this certificate invalid.
 4. Should the specified rules, regulations or standards be amended during the validity of this certificate, the product is to be re-approved by this Society in accordance with the requirements as amended.

Product Description and/or Approval Condition

Date of Issue : 8th November, 2021

A. Product Description

1. Product Specification

1) System Description (Model: CompactClean BWMS)

The CompactClean BWMS is a ballast water management system. The treatment sequence of CompactClean BWMS under ballast water uptake mode is filtration and UV disinfection and UV disinfection mode is operated at the discharge mode without filtration.

The CompactClean BWMS is available in two versions.

A) CompactClean (CC): Operated in US mode.

B) CompactClean OptIMO (OptIMO): Operated either in IMO or US mode.

2) General Specification

- Treatment Rated Capacity (TRC) : 35 ~ 2500 m³/h
(For ballast water uptake, TRC of CompactClean BWMS is limited by the flow rate of either the selected UV unit or the selected filter model, whichever is lower.
For ballast water discharge, TRC of CompactClean BWMS is limited by the flow rate of the selected UV unit model.)
- Operating Salinity Condition : N/A
- Temperature of Ballast Water : N/A
- Holding Time : N/A
- Design Pressure : 10 bar
- Min. UV Intensity

Mode	UVI limit for dimming of UV lamp power (W/m ²)	UVI limit for operating at TRC of UV Unit (W/m ²)	Lowest UVI limit for which BWMS is type approved (W/m ²)
IMO Mode	900	800	170
US Mode	1000	880	227

* Note

- (1) UVI limit for dimming of UV lamp power : Dimming of UV lamp power starts when UVI measured exceeds 900 W/m² (IMO mode) and 1000 W/m² (US Mode), where after lamps will be dimmed to maintain a UVI of 900 W/m² (IMO mode) and 1000 W/m² (US Mode) ±50. The maximum dimming is 20% of maximum rated power.
- (2) UVI limit for operating at TRC of UV Unit : As per the CFD analyses provided, this UVI limit corresponds to an UVT of 62% (IMO mode) or 65% (US mode). The flow reduction is active below UVI 800 W/m² (IMO mode) and 880 W/m² (US Mode).
- (3) Lowest UVI limit for which BWMS is type approved : The lowest UVT at which land-based tests confirmed treatment in compliance with the discharge standard was 35% (IMO mode) or 40% (US mode).

3) UV Reactor

UV Reactor	Quantity of UV lamps	UV lamp Power	Maximum Flow Rate (m ³ /h)	
			IMO Mode	US Mode
V10024	2	4 kW	60	40
V15044	4	4 kW	135	85
V15064	6	4 kW	240	135
V20066	6	6 kW	370	250
V20086	8	6 kW	510	340
V25126	12	6 kW	750	500
V30186	18	6 kW	1200	750
V35246	26	6 kW	1650	1000
V40366	36	6 kW	2500	1500

4) Filter

- a) ACB filter series with 20 μm mesh manufactured by Filtrex
 - Minimum Filter Inlet Pressure : ≥ 1.3 bar
 - Design Pressure : 10 bar

Product Description and/or Approval Condition

Date of Issue : 8th November, 2021

- Differential Pressure Triggering Back flushing : 0.3 bar
- Maximum Filter Differential Pressure : 1.1 bar

Filter Model	Filtrex Filter Model	Maximum flow rate(m ³ /h)
F0035	ACB-903-65	35
F0055	ACB-904-80	55
F0087	ACB-906-100	87
F0135	ACB-910-150	135
F0190	ACB-915-150	190
F0255	ACB-935-200	255
F0340	ACB-945-200	340
F0515	ACB-955-250	515
F0770	ACB-985-300	770
F1040	ACB-999-350	1040
F1500	ACB-9100-400	1500
F2100	ACB-9120-500	2100
F3000	ACB-9200-600	3000

b) aquaBoll BWT BB filter series with 25 μ m mesh manufactured by BOLLFILTER

- Minimum Filter Inlet Pressure : \geq 1.3 bar
- Design Pressure : 10 bar
- Differential Pressure Triggering Back flushing : 0.3 bar
- Maximum Filter Differential Pressure : 1.1 bar

Filter Model	Filtrex Filter Model	Maximum flow rate(m ³ /h)
B0050	aquaBoll BWT BB 280x235 DN 80	50
B0100	aquaBoll BWT BB 330x335 DN 100	100
B0170	aquaBoll BWT BB 400x395 DN 150	170
B0340	aquaBoll BWT BB 430x735 DN 200	340
B0515	aquaBoll BWT BB 540x835 DN 250	515
B0770	aquaBoll BWT BB 580x1235 DN 300	770
B1040	aquaBoll BWT BB 700x1235 DN 350	1040
B1500	aquaBoll BWT BB 800x1235 DN 400	1500
B2000	aquaBoll BWT BB 1000x1535 DN 500	2000
B2500	aquaBoll BWT BB 1200x1535 DN 600	2500
B3000	aquaBoll BWT BB 1400x1535 DN 600	3000

6) Control & Monitoring Equipment

Item	Manufacturer	Type (Model)
Main Panel	DESMI OCEAN GAUARD A/S	-
UV Intensity Sensor	IL Metronic Sensortechnik	DVGW-Type SUV 20.2 A2 Y2 C
UV Lamp	DESMI OCEAN GAUARD A/S	4kW, 6kW
Flow Meter	Endress Hauzer	PROMAG 50

7) Software

- Software Version : V1. XX. YYYY

* All changes in software are to be recorded as long as the system is in use onboard and Major changes to the software are to be approved before installed in the computer.

2. Approved Drawings and Documents

1) Approved Document

- Type Approval Drawing Package approved on 3 August, 2021
- Type Approval Drawing Package approved on 2 November, 2021

Product Description and/or Approval Condition

Date of Issue : 8th November, 2021

- 2) Reviewed Document
 - Doc. No. 162145 Operation Maintenance and Safety Manual for CompactClean Ver. 2

3. Test Reports, etc.

- 1) Land-based Test Report
 - Biological efficacy performance evaluation of CompactClean BallastWater Management System in landbased test : Report No. 11821290 issued by DHI Denmark, dated 2018-09-20
 - Biological efficacy performance evaluation of CompactClean Ballast Water Management System in landbased test, Supplementary test cycles with short holding time : Report No. 11821290 issued by DHI Denmark, dated 2019-03-21
 - Biological efficacy performance evaluation of CompactClean BallastWater Management System in landbased test : Report No. 11824997 issued by DHI Denmark, dated 2020-12-07
 - Biological efficacy performance evaluation of CompactClean BallastWater Management System in landbased test : Report No. 11825920 issued by DHI Denmark, dated 2021-07-02
- 2) Shipboard Test Report
 - Biological efficacy performance evaluation of CompactClean Ballast Water Management System in shipboard test : Report No. 11821290 issued by DHI Denmark, dated 2018-09-21
- 3) Environment Test Report
 - Report No. 117-36341-1 Rev.1 issued by FORCE Technology, dated 2019-02-28
- 4) Function Test Report
 - Readiness Evaluation Report dated 2021-08-10 witnessed by surveyors of the Society
- 5) Etc.
 - UV Compact Clean Scaling methodology evaluation Version 2
 - System Design Limitations (SDL) of CompactClean BWMS, dated 2018-09-21
 - Scaling of CompactClean UV Disinfection Unit, dated 2018-04-08
 - Risk Assessment, Doc. No 157936 Ver.5
 - Design Study Filtrex Filter vs. Boll Filter (V.A. 16.07.2021)
 - Scaling of Compactclean UV Disinfection Unit, Doc. Desmi-180530-USCG Report, dated 2018-05-30
 - Compactclean IMO-scaling, Doc. DESMI-210609-CompactClean IMO-scaling, dated 2021-06-09

B. Approval Condition

1. Application & Limitation

- 1) This certificate is issued on the basis of the test reports and the documentation type approved by Danish Administration (Date: 13 Oct., 2021 / Certificate No: TAP00002DR)
- 2) Degree of protection shall be compliant with the Rule Pt.6, Ch.1, Sec.2, Art.201.2.(5).
- 3) The manufacturer should inform the Society of all kinds of revisions of the equipment including software. If the changes are recognized to affect functionality of the approved equipment, type test to confirm the reliability of the revised equipment may be performed in the presence of our surveyor.
- 4) Unless specially directed by the Administration, this approval is not to be construed as a substitute for a flag Administration's approval. This certificate may not be used for Korea flagged vessels.
- 5) This certificate will be automatically revoked when the type approval certificate issued by Danish Administration is not valid.
- 6) Any latest conventions or requirements settled by International Maritime Organization or Administrations should be retroactively applied at the earliest possibility.
- 7) Treatment Rated Capacity (TRC) for the above models may be considered by installation of multiple units in parallel, provided that the ultimate functioning and effectiveness of the system on board a ship of the type and size for which the equipment will be certified will not be adversely affected. In this case, the appropriate procedure according to BWM.2/Circ.8 should be carried out.

Product Description and/or Approval Condition

Date of Issue : 8th November, 2021

- 8) Any combination of Main Unit(s) beyond the list of identified BWMS Models is allowed, as long as their respective stated Flow Rate(s) is adhered to for any given operation, and on the basis of the recognized Design Guide.
- 9) Components composed of ballast water management system shall not be installed on exposed weather deck.
- 10) Explosion-proof certification by a notified/recognized certification body is not covered by this certificate. Ratings and special condition for safe use in hazardous areas are to be obtained from the relevant valid Ex-certificate.

2. Individual Product Cert. and Drawing Approval Requirement

- 1) Individual product certification is required in accordance with Rule Pt.9, Ch.10, Sec.306.4.
- 2) For the BWMS intended to undergo a classification survey during construction or retrofit, the following documents for individual vessel are to be submitted to the Society.
 - Ballast Piping Diagram
 - Electrical Schematic Drawings of BWMS
 - Operation and Maintenance Manual (if required by Administration)
 - Any other documents deemed necessary by the Society and/or Administration

3. Marking

- 1) The product or packing is to be marked with the manufacturer's name and type designation on a suitable position.

4. Others

- 1) Test condition of Cabinets (IACS UR E10 Rev.6)

Test	Condition	Remark
EMC	All locations excluding the bridge and deck zone	-
Temperature	5 ~ 55°C	-
Vibration	Acceleration $\pm 0.7g$	-
Salt mist	Not Applied	-

< End of Certificate >